CLAIMS

1.   In a system using the nonlinearity of a propagation medium to demodulate ultrasonic waves having audio modulated onto the ultrasonic frequency, audio signal processing circuitry comprising:

a delay means for the audio signal providing a delayed audio signal;

envelope generator means providing an envelope signal which is a function of peaks of the audio signal over a predetermined interval;

combiner means for the delayed audio signal and the envelope signal, the resulting combined signal being useful in processing for modulation of said ultrasonic frequency.

2.   The audio signal processing circuitry of claim 1 means comprise analog circuitry.

3.   The audio processing circuitry of claim 1 wherein at least on of said delay means and envelope generator means comprise digital circuitry.

4.   The audio processing circuitry of claim 3 wherein both said delay means and envelope generator means are digital and

means are provided for providing digital sampling of said audio signal;

said delay means delays said audio signal N samples; and

said envelope generator means examines M prior samples of digitized audio signal.

5.   The audio processing circuitry of claim 4 wherein N and M are set at values to align the digitized audio signal to corresponding times in the envelope signal.

6.   The audio processing circuitry of claim 1 further including a low pass filter for the envelope signal and having a settling time or group delay where the delay interval corresponds to a settling time or group delay of the Low pass filter.

5   7.   The system of claim 1 further including premodulation processing means responsive to the combined signal for modifying the combined signal to allow the medium demodulation to provide a demodulated acoustic signal which is a substantially accurate representation of an original audio signal applied to said audio processing circuitry.

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8.   The system of claim 7 wherein said premodulation processing means generates an approximate square root function on the combined signal.

9.   The system of claim 7 wherein said premodulation means processes said

15   combined signal by a polynomial expansion of a predetermined number of terms.

10.   The system of claim 7 wherein said premodulation means processes said combined signal by use of a precalculated lookup table.

20   11.   The system of claim 7 wherein said premodulation means includes upsampling and low pass filter means to provide an enhanced bandwidth prior to premodulation processing.

12.   The system of claim 1 further including up sampling and low pass filter means

25   prior to any modulation.

13.   The system of claim 7 wherein said premodulation processing provides polarity reversal of the combined signal.

14.   The system of claim 13 wherein said polarity reversal is a function of one or more of the criteria that the combined signal as applied to the premodulation means is: close to a zero value; has a relatively high slope; short-time power spectrum estimate indicates a wide bandwidth; and slope is near a zero value while a rate of change of the slope is positive.

15.   The system of claim 1 further including means for ultrasonically modulating the combined signal.

16.   The system of claim 15 further including means for projecting ultrasonic sound wave representations of the modulated combined signal.

17.   The system of claim 16 wherein said projecting means includes amplifier means and transducer means.

18.   The system of claim 17 further including means for providing an offset bias in the modulated signal.

19.   The system of claim 18 wherein said bias maintains the modulated signal in a predetermined polarity.

20.   In a system using the nonlinearity of a propagation medium to demodulate ultrasonic waves having audio modulated onto the ultrasonic frequency, audio signal processing circuitry comprising:

        envelope generator means providing an envelope signal which is an approximate function of peaks of the audio signal over a predetermined interval, said approximatie function having misaligment of envelope and audio signal;

        means for converting the audio signal and the envelope signal into an ultrasonic signal characterized by a carrier signal and reduced misalignment.

21.   The system of claim 20 wherein said converting means includes means for delaying the audio signal.

22.   The system of claim 20 wherein said converting means includes means for
5   adjusting the level of said carrier signal to reduce said misalignment.

23.   In a system using the nonlinearity of a propagation medium to demodulate ultrasonic waves having audio modulated onto the ultrasonic frequency, audio signal a processing method comprising:
10   generating an envelope which is an approximate function of peaks of the audio signal over a predetermined interval, said approximation having misaligment of envelope and audio signal;
      converting the audio signal and the envelope signal into an ultrasonic signal characterized by a carrier signal and reduced misalignment.
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24.   The method of claim 23 wherein said converting step includes the step of delaying the audio signal.

25.   The method of claim 23 wherein said converting step includes the step of
20   adjusting the level of said carrier signal to reduce said misalignment.